

A RESPIRATORY APPARATUS FOR FIREMEN.

BY ARTHUR INKERSLEY.

An ingenious respiratory apparatus for the use of firemen has been invented by Mr. Charles E. Chapin, a mechanical draftsman who lives in Berkeley, Cal. It consists of a hood lined with oiled silk to cover the head and an air cylinder which is strapped on the back. The cylinder is divided into three chambers, carrying under a pressure that can be regulated enough air to last an hour. The air is conducted by a rubber tube to the headpiece, the exhaled air passing out through a valve before the mouth. The fireman can get enough air to fill his lungs comfortably but cannot expend the supply in a short time, as he might be tempted to do if he became frightened. The main supply of air comes from the outer cylinders, the middle one being smaller and to be drawn upon only after the other two are exhausted. The apparatus can be adjusted on the back in half a minute, and, as it weighs only 23 pounds, it does not impede the fireman in his work.

A test of the apparatus has been made in the presence of the fire chief of San Francisco. A man equipped with the apparatus entered a room filled with the fumes of burning sulphur and worked there for a full hour, coming out with his throat and lungs perfectly free. The fire commissioners of San Francisco will have a practical demonstration of the apparatus, which is simple

and not likely to get out of order. If on further test it proves satisfactory, it will be adopted by the San Francisco fire department and, doubtless, by the fire commissioners of other cities and towns.

THE MOST POWERFUL EXPRESS LOCOMOTIVE IN GREAT BRITAIN.

Although not one of the largest, in point of track mileage, the Great Northern Railway is one of the most important of British railways, as it forms an important connecting link in the East Coast route between London and Scotland. Among the British railways, the Great Northern was foremost in the adoption, for its fastest passenger traffic, of the well-known "Atlantic" type of locomotive, a considerable number of which have, during the past three or four years, been introduced into service. Although these "Atlantic" simple locomotives are generally regarded as being well abreast of the times, and represent some 35 per cent more power than the engines they replaced, yet the directorate of the company, acting upon a suggestion made by their locomotive engineer, some short time ago took the unusual step of issuing invitations to locomotive builders, specifying the duty to be done, and

asking them to build engines, compound or otherwise, for trial on the Great Northern. In accordance with this decision, a contract was, toward the end of last year, placed with a private firm for a powerful, experimental, four-cylinder, balanced compound locomotive of the "Atlantic" type, to be built from designs submitted by the builders. The placing of this order by the Great Northern Railway Company is rendered all the more interesting by reason of the fact that all the leading British railways have for many years past made it a practice to build and repair all of their locomotives at

face is 2,514 square feet, to which the tubes (which number 149 and are $2\frac{3}{4}$ inches in diameter outside, with a length of 12 feet 4 inches and of Serve steel) contribute 2,344 square feet, and the firebox the remaining 170 square feet. The working pressure is 200 pounds per square inch, and the grate area 31 square feet. The copper firebox has a length of 9 feet, a width of 4 feet $10\frac{1}{4}$ inches, and a depth at the front of 6 feet $4\frac{1}{2}$ inches and a depth at the back of 4 feet 9 inches. It was restricted in size on account of the smoke troughs in the running sheds, and also the coaling plat-

forms on the Great Northern Railway, and it was for these reasons that the "Belpaire" pattern firebox, which had been originally designed for this locomotive, could not be used. The engine, it is of interest to note, has been fitted with a starting valve, which is so designed as to admit steam, at a reduced pressure, to the receiver at starting. The screw reversing gear is designed so as to permit the cut-off in one cylinder, or set of cylinders, to be varied independently of that in the other. This insures that the expansion shall be reasonably shared between the cylinders, and prevents undue rise of pressure in the receiver, with the resulting excessive stresses on the low-pressure piston. The motion may be reversed from any position in one gear to the corresponding one in the other by moving one handle, and there is no possibility of jamming the screw, as in some of the other ar-

rangements now in use. The engine, exclusive of its tender, weighs 80 tons. The tender, which is of the Great Northern Company's own standard pattern, is carried on six wheels, each 4 feet 2 inches in diameter, has a capacity of 3,670 gallons of water and space for 5 tons of fuel, and weighs 45 tons, so that the new four-cylinder compound has an aggregate weight on metals of 125 tons. The engine is now being submitted to a series of exhaustive trials on the Great Northern Railway Company's main line.

Compound for Anatomical Preparations.—Mix first, hot, 16 parts of wheat flour beaten with as much cold water, and add 32 parts of boiling water, with 2 parts of pulverized gum arabic dissolved in 4 parts of boiling water, and boil the mixture over a gentle fire. On the other hand, dissolve 2 parts of pulverized alum in 4 parts of boiling water, and pour, stirring, into the first mixture, which is to be kept on the fire. After perfect homogeneity has been secured, add 2 parts of acetate of lead dissolved in 4 parts of boiling water. Finally, stir energetically and add about 1.50 parts of corrosive sublimate. This compound is antiseptic, but it must not be forgotten that it is poisonous.—Cosmos.



A Hood Lined with Oiled Silk Covers the Head of the Fireman.

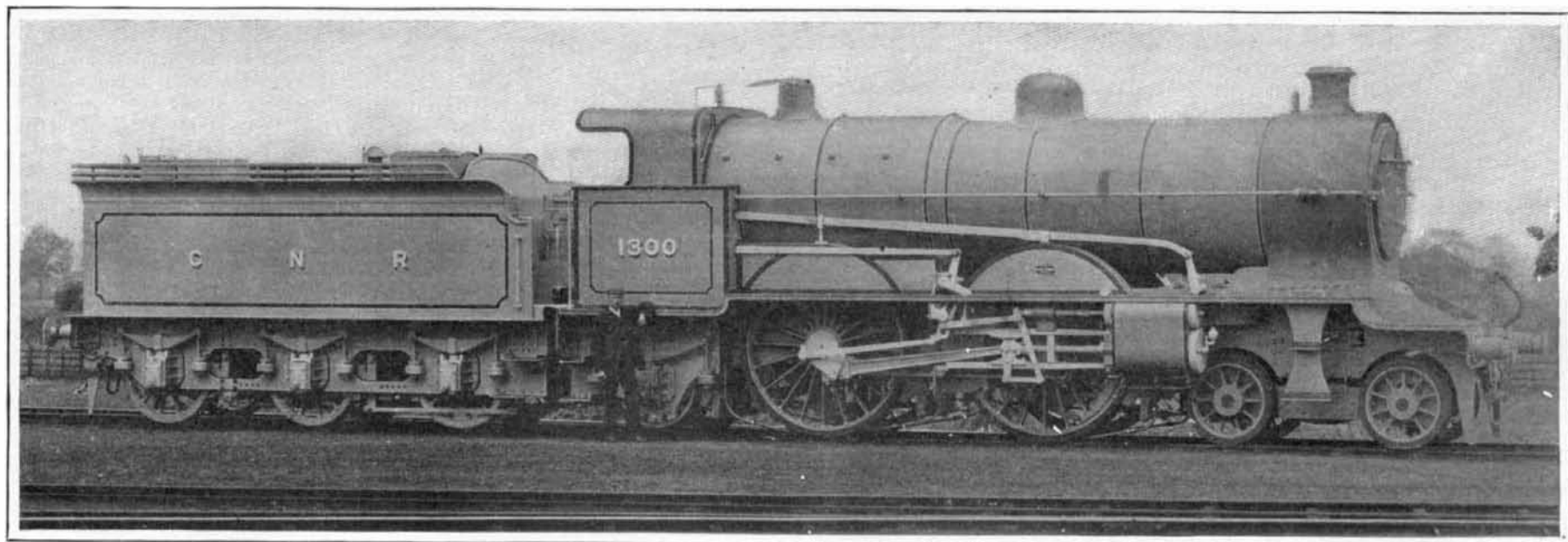


An Air Cylinder is Strapped on the Back of the Fireman. Enough Air is Carried to Last an Hour.

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their own works—the private locomotive establishments of Great Britain being left to deal only with the work required by the smaller railways of Great Britain, and also locomotive contracts for the British colonies and for foreign delivery.

The new four-cylinder balanced "compound" of the Great Northern Railway Company has quite recently been completed, and, by the courtesy of the builders, the Vulcan Foundry, Limited, we are enabled to reproduce the photograph and give the following particulars illustrating this unique type of British express engine. As will be noticed from the engraving, the engine is of rather unusual proportions for a British railway, and happens to be not only the heaviest, but also the largest locomotive of its type ever built in Great Britain for operation over a British railway. The high-pressure cylinders are 14 inches in diameter, the low-pressure cylinders are 23 inches in diameter, and the piston stroke in each case is 26 inches. The driving wheels are 6 feet 8 inches in diameter on tread, the diameter of center being 6 feet 2 inches. The boiler barrel has a length of 11 feet 11 inches, with an outside diameter of 5 feet $1\frac{5}{8}$ inches, the thickness of the plates being $11/16$ of an inch. The total heating sur-



Cylinders: Diameter, 14 and 23 inches by 26 inches stroke. **Driving wheels,** 80 inches diameter. **Heating surface,** 2,514 square feet. **Steam pressure,** 200 pounds. **Weight of engine,** 80 tons; **tender,** 45 tons.

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